IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Philip D. Nguyen, et al.	Attorney Docket: 2000-IP-043
Serial No.: 09/882.572	Group Art Unit: 3672
Filing Date: June 13, 2001	Examiner: Neuder, William P.

For: **METHODS AND APPARATUS FOR GRAVEL PACKING OR FRAC PACKING WELLS**

DECLARATION UNDER 37 CFR 1.131

Mail Stop Non-Fee Amendment
Commissioner of Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

1. My name is Michael W. Sanders. I am over twenty-one years of age and competent to make this Declaration. All statements made herein based on personal knowledge are true and correct and all statements made upon belief are believed to be true and correct. I am a named inventor on the above-referenced application for U.S. patent.

2. I have reviewed the attached Exhibits A-C and state that they are true and correct copies. Exhibit A is a true and correct copy of a Halliburton Energy Services Group Invention Disclosure by Philip D. Nguyen, Henry L. Restarick and Michael W. Sanders, consisting of three (3) pages, numbered 2000IP 000697 and entitled "A Method of Preparing Downhole Tool for Completions in Wellbores with Long Intervals." Exhibit B is a true and correct copy of a Halliburton Energy Services Group Invention Disclosure by Philip d. Nguyen and David E. McMechan, consisting of three (3) pages, numbered 2000.1144 and entitled "A Method and Apparatus for Protecting Sand Control Screens during Installation." Exhibit C is a true and correct copy of a Halliburton Energy Services Group Invention Disclosure by Michael Wayne Sanders, Ron Dusterhoft, and Philip d. Nguyen, consisting of two (2) pages, numbered 2000 IP 000043 and entitled "A Method of Improving Transport and Packing of Proppant in Wells with Long Production Intervals." Each of these Exhibits is a business document kept in the ordinary course of business.

3. Exhibit A was signed by two of the inventors of the subject matter of the Disclosure, Mr. Nguyen and Mr. Sanders, and by a witness, on April 26, 2000, indicating invention of the disclosed matter at least as early as that date. The third inventor, Mr. Restarick signed the Invention Disclosure on May 2, 2000.

4. Exhibit B was signed by the two inventors of the subject matter of the Disclosure, Mr. Nguyen and Mr. McMechan, and a witness on July 3, 2000, indicating invention of the disclosed matter at least as early as that date.

5. Exhibit C was signed by two of the inventors of the subject matter of the Disclosure, Mr. Nguyen and Mr. Sanders, and a witness on December 17, 1999, indicating invention of the disclosed matter at least as early as that date.

6. Additional evidence indicating invention of the disclosed subject matter at least as early as the indicated dates includes the "Received" date stamps indicating receipt by Robert A. Kent of the Halliburton Patent Department. Receipt date stamps are evident on all three Exhibits.

7. Under penalty of perjury, I acknowledge and understand that making willful false statements and the like herein are punishable by fine and/or imprisonment under 18 U.S.C. §1001 and may jeopardize the validity of the referenced application or any patent issuing thereon.

Signed this 24 day of Oct., 2003.

Inventor's Signature:

Michael W. Sanders

Michael W. Sanders
Citizenship: USA
Address: 3207 Fox Hollow Road
Duncan, Oklahoma 73533

HALLIBURTON ENERGY SERVICES GROUP

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INVENTION DISCLOSURE

2000IP 000697
P.M. No.

TITLE: A Method of Preparing Downhole Tool for Completions in Wellbores with Long Intervals

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Description of Invention: Give brief description of invention, and where possible a sketch. Do not write on back of this sheet. If additional space is necessary, use additional disclosure sheets (R&S 2311) and number consecutively. Sign and date each sheet and have each witnessed. Witnesses must be persons capable of understanding invention. If invented prior to date on this sheet, give full details - date, to whom disclosed, identify drawings, if any, etc. If used in the field, specify for what company and designate well and date.

Background

Perforating tubing or shroud surrounding the sand control screens have been shown to provide alternate flow paths, with the ability to bypass the sand bridges that prevent the complete placement of sand in the annulus in gravel packing or the transport of proppant into the fractures in frac pack operations. However, as the interval length in the zone of interest becomes extensively long, the potential of premature screenout even with the application of perforated shroud could occur. The leakoff of fluid from the slurry into the high permeable formations surrounding the wellbore alter the flow behavior of the slurry inside the annuli, either by dehydrating more sand on the formation surface or on the screen, or decreasing the flow velocities in the annuli. As the velocity reduces below the critical velocity orresuspension velocity, the potential of screenout or bridging off is imminent.

Therefore, it is desired to develop a new and improved perforated shroud system that can greatly enhance the sand placement regardless of the length of the interval and high potential leakoff.

Solution

We would like to disclose a method of preparing a downhole tool for completing wellbores having long producing intervals. The method is described as follows:

1. Start out with a flat metal sheath with dimensions of desired circumference and length as in the perforated shroud.
2. Perforations or holes of desired size and density are punched or stamped on the metal sheath.
3. Blank tubes are welded to the metal sheath in the pattern as shown in figure 1. The number of tubes can be more than 1 depending on the application and the sizes of perforated shroud and screen.
4. Both ends of blank tubes are cut or shaped as shown in figure 2
5. The perforated sheath is rolled up with the blank tubes on the inside wall to be welded into a shroud.

The pattern of blank tubes placed on the perforated sheath and the shape of blank tube ends together helps prevent the potential of sand control screens getting caught or damaged as they are inserted inside the perforated shroud. These blank tubes act as centralizer for the sand control screen and provide additional integrity for the perforated shroud. Since the blank tubes are not directly attached with the screens, flow and flow area through the screens are not obstructed, especially during production.

The conventional sand control screens or premium screens (such as Poroplus) can be pre-installed inside this newly designed perforated shrouds before being brought to the well sites. The perforated shroud should provide protection to screen during transport. The screens can also be lowered to the wellbore and inserted inside the perforated shroud in the conventional manner. Again, the perforated shroud should prevent the screens from contacting with the formation wall, minimizing it from damaging and plugging.

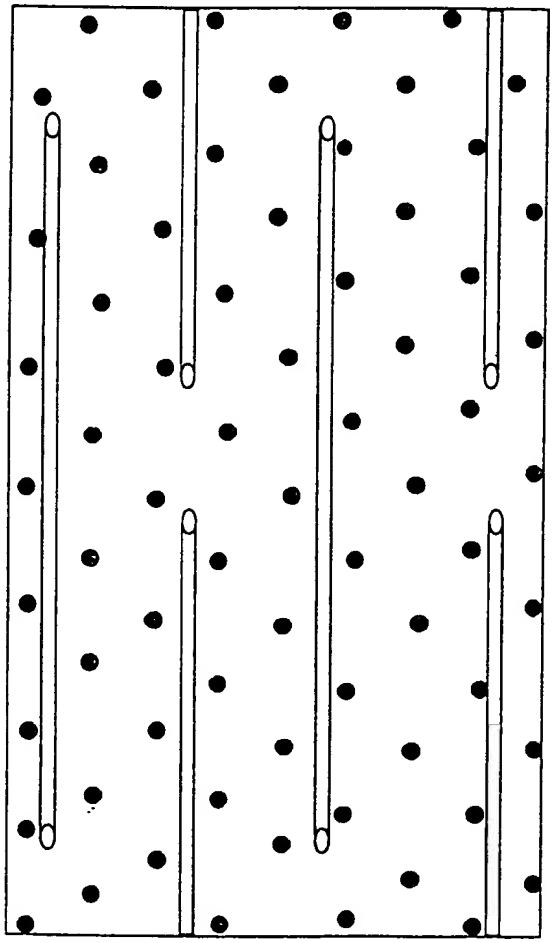

Figure 1 – Schematic layout of blank tubes attached to the inside of the perforated shroud (before it is rolled up and welded).

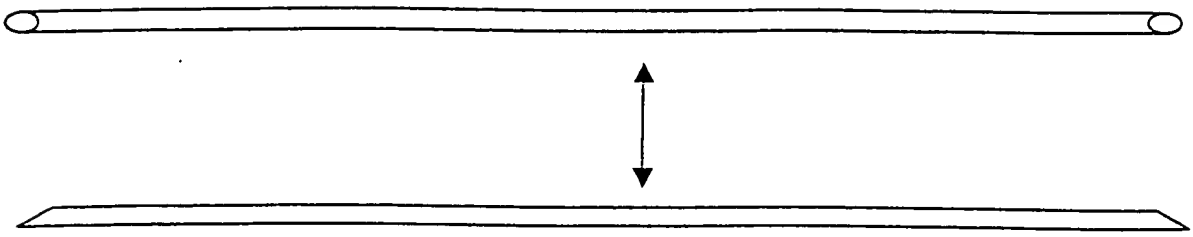

Figure 2 – Both ends of the tubes are shaped as shown to prevent damage to the screen.

Signature of Inventor

Signed at Duncan OK this 26 day of April, 2000.

Signature of Inventor

Signed at Carrollton, TX this 2 day of May, 2000.

Signature of Inventor

Signed at Michael W. Sanders this 26th day of April, 2000.

Explained to and Understood by Me David Barnett 4/26/00
Signature of Witness Date

HALLIBURTON ENERGY SERVICES GROUP

INVENTION DISCLOSURE

P.M. No. 2000.1144

TITLE: A Method and Apparatus for Protecting Sand Control Screens during Installation

FULL NAME OF SOLE OR FIRST JOINT INVENTOR						
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Description of Invention: Give brief description of invention, and where possible a sketch. Do not write on back of this sheet. If additional space is necessary, use additional disclosure sheets (R&S 2311) and number consecutively. Sign and date each sheet and have each witnessed. Witnesses must be persons capable of understanding invention. If invented prior to date on this sheet, give full details - date, to whom disclosed, identify drawings, if any, etc. If used in the field, specify for what company and designate well and date.

Disclosure

We would like to disclose a method and apparatus for protecting sand control screens during their installation. The method and apparatus are described as follows.

1. Sand control screens are first centralized within a perforated shroud via the use of blank, hollow tubes of various lengths. These hollow tubes have ends that are shaped at an angle to prevent damage to the screen or potential of becoming an obstruction (Fig. 1).
2. The perforated shroud provides a) alternate flow paths for the gravel slurry during gravel placement as the formation of sand bridges or dunes cause restriction to its flow, and b) protection for the screens during their placement into the well bore, either from invasion of mud cake or mechanical damage (Figs. 1 and 2)
3. The hollow tubes provide alternate flow paths for the slurry if there is any flow restriction in the well bore wall-perforated shroud annulus or in the perforated shroud-screen annulus (HES 2000IP-697). The hollow tubes also act as centralizers for the perforated shroud and provide additional space for gravel pack surrounding the screen to act as a filter medium for sand control (Figs. 1 and 2).
4. After the zone has been isolated, the perforated shroud and screen assembly are placed into the zone of interest. The perforated shroud is allowed to lie down directly at the bottom side of the well bore without the need of centralization (Figs 1 and 3).
5. The placement of gravel (using brine or low viscosity gel based fluid or oil based fluid as carrier fluid) is performed with the designed pump rate (between 1 and 2.5 ft/sec as flow velocity) and sand concentration (less than 1.5 lbs/gal) to allow a steady placement and complete packing of gravel in the annuli of well bore wall/perforated shroud and perforated shroud/screen (Fig. 4).

Observations in our experiments reveal that an eccentric position of tubing within a tubing allows a more steady and even placement of gravel within the annulus as compared to a concentric position. In the concentric position of a tubing within a tubing (provided by a means of centralization), it was observed that the sand slurry was free to flow underneath the centralized tubing, causing more turbulence and erosion on the gravel that has been placed in the alpha wave (i.e. forward direction of gravel placement).

With the conventional alpha-beta, gravel placement in which the screens are centralized to be concentric with respect to the well bore, approximately only 50 to 70 percent of the screen diameter is covered with gravel bed height during the alpha wave, the rest is to be covered by the gravel during the beta wave (i.e. backward direction). However, if any premature bridging occurs, the beta wave can not be successfully established, leaving the rest of the screen unpacked. In contrast, with the eccentric position, the grave bed can cover close to or more than 100 percent of the screen diameter

TITLE: A Method and Apparatus for Protecting Sand Control Screens during Installation

during the alpha wave alone. Beside a steady placement of gravel during the alpha wave, the eccentric position provides addition space for the gravel placement during the beta wave.

As the screen assembly is placed into the well bore, the perforated shroud helps protect the screens. The screen slides on the smooth surface of the shroud instead of being dragged on the rugged well bore wall, layered with mud cake.

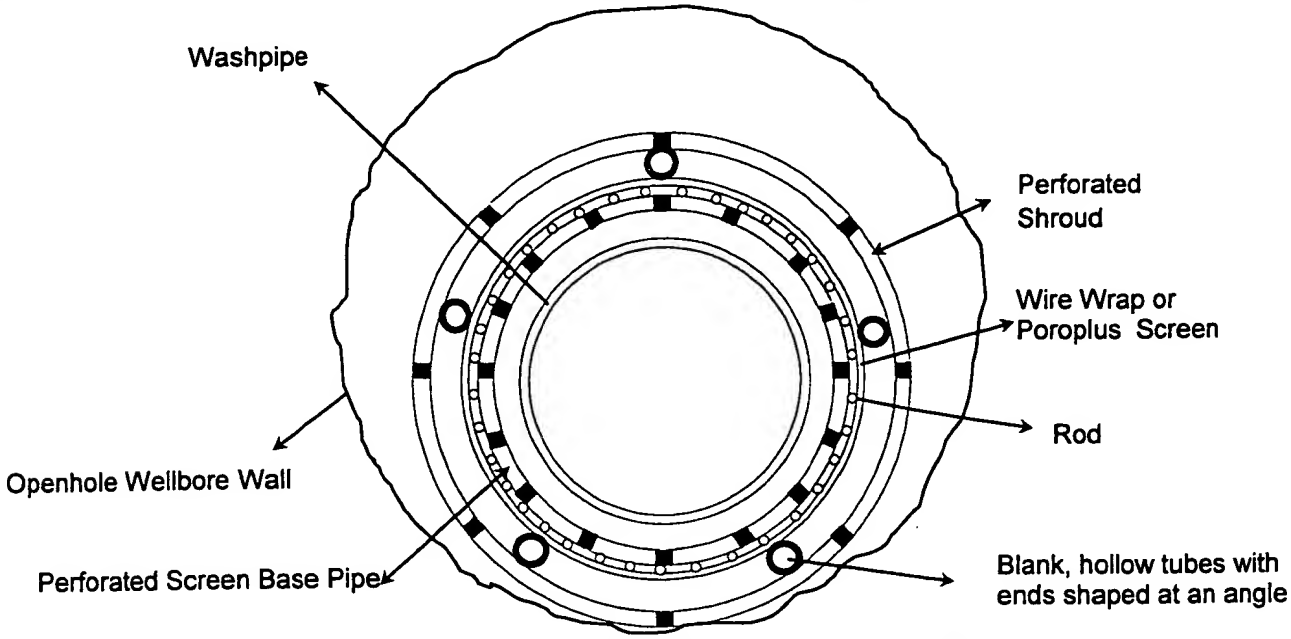

Fig. 1 – Schematic layout of centralized screen inside the perforated shroud and the eccentric position of the assembly with respect to the wellbore wall.

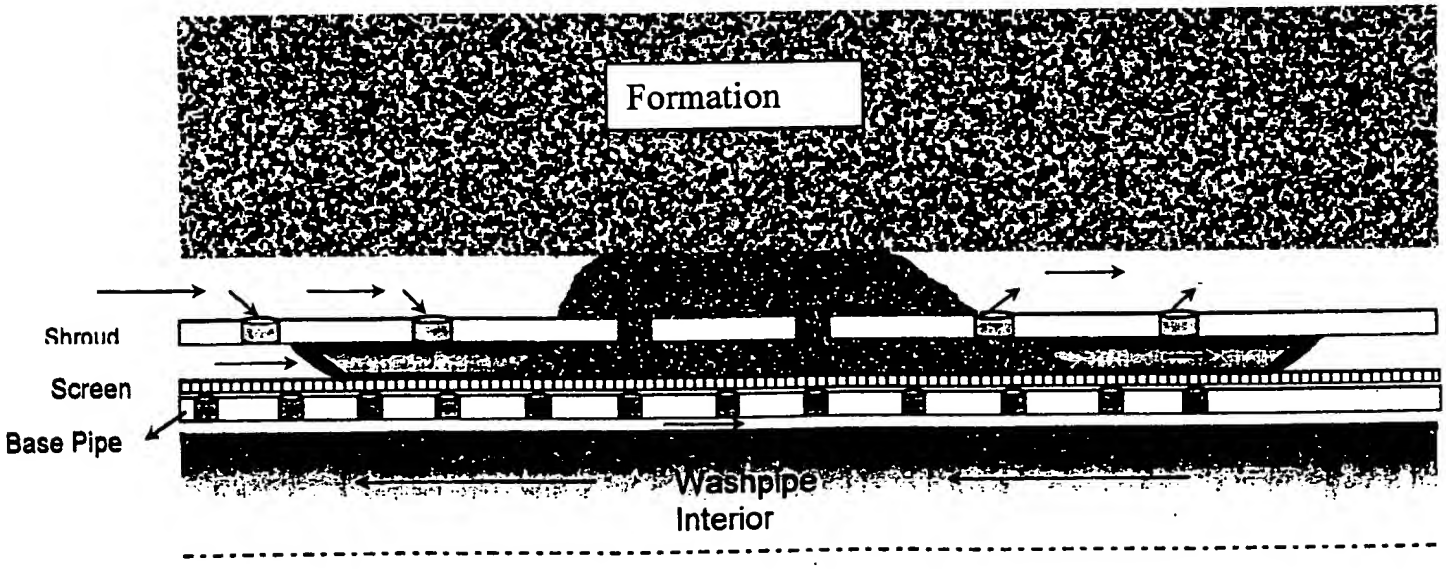

Fig. 2 – Cross sectional view showing the attachment of blank tubes inside perforated shroud provides another alternate flow path for the sand slurry to bypass the sandbridge formed in the annuli as a result of high fluid leakoff.

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INVENTION DISCLOSURE

P.M. No. 2000.1144

TITLE: A Method and Apparatus for Protecting Sand Control Screens during Installation

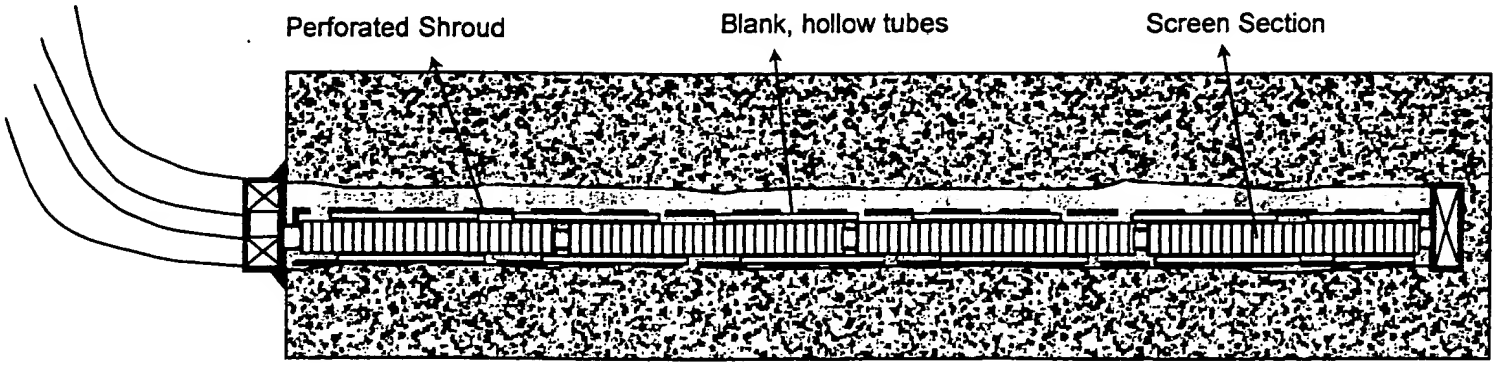

Fig. 3 – Schematic layout of perforated shroud and screen assembly in eccentric position within the well bore.

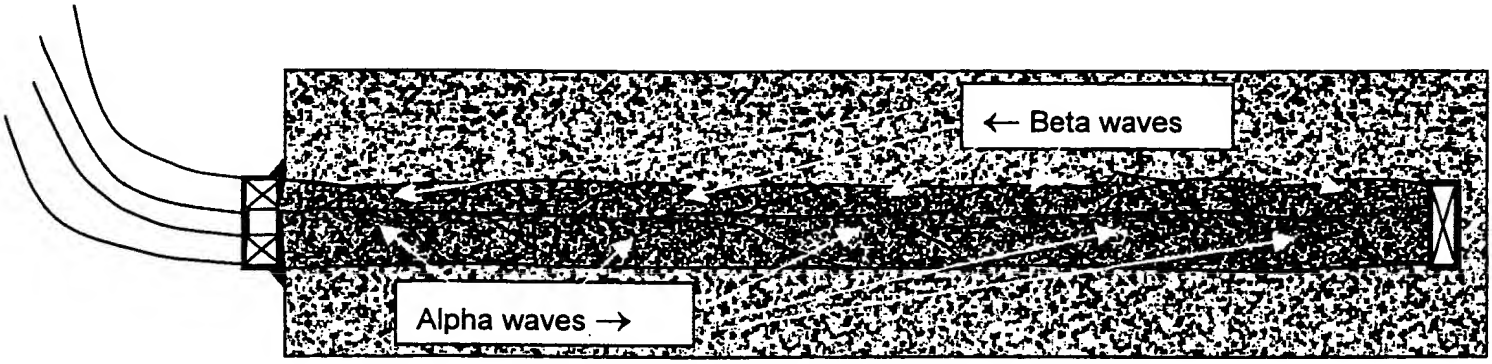

Fig. 4 – A steady establishment of alpha and beta waves assures a complete packing of gravel in all annuli.

Signature of Inventor

Signed at Duncan, OK this 3rd day of July, 2000.

Signature of Inventor

Signed at Duncan, OK this 3rd day of July, 2000.

Explained to and Understood by Me _____ Signature of Witness _____ July 3, 2000 Date

RECEIVED
JUL 05 2000
ROBERT A. KENT
PATENT DEPARTMENT

HALLIBURTON ENERGY SERVICES GROUP

PM. No. 2000 IP 000043

Page 1 of 2

INVENTION DISCLOSURE

P.M. No.

TITLE: A Method of Improving Transport and Packing of Proppant in Wells with Long Production Intervals

→ 8-14-2000

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Background

The use of a perforated liner which is concentric to, or on the outside of, a sand control screen has proven to provide an effective method of packing the annulus between the concentric liner and the wellbore and between the screen and the concentric liner. This provides a method of bypassing the sand bridges areas which may be caused by excess fluid loss to the formation. This simple tool helps to improve the packing efficiency in the screen/wellbore wall annulus regardless of whether the gravel is being transported by water or viscosified fluid.

An even more reliable means of packing gravel in wellbore with extended length, i.e. several thousand feet, as in the cases of long horizontal wells, is desirable as compared to the current configuration.

The number of blank tubes attached along the circumference of the perforated liner can be one or more, but 4 is preferable, and they should be overlapped as shown in Figure 1. The blank tubes can be spaced out by the same distance as their length (Fig. 2) along the axis of the perforated liner.

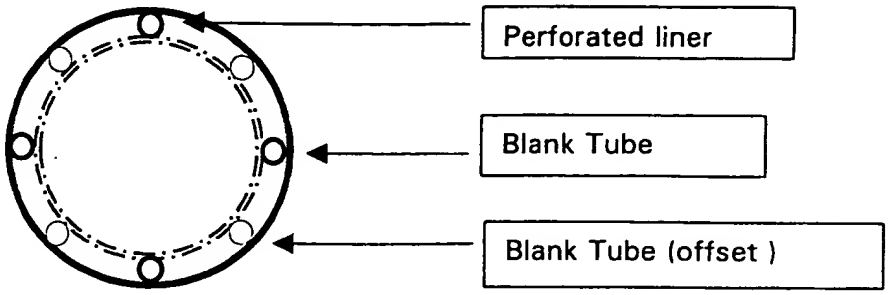

Figure 1

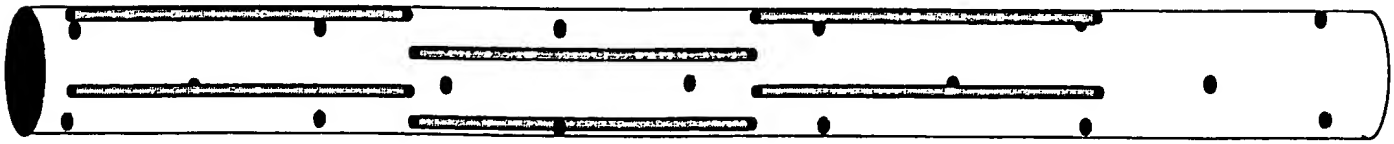

Figure 2

Another approach is to use blank sleeves as shown in Figure 3 to provide an additional annular flow path thus improving on the existing perforated liner method.

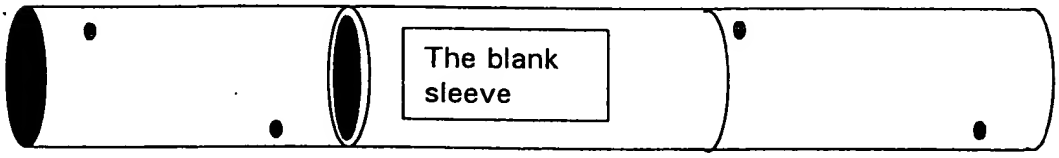

Figure 3

Signed at Duncan, Oklahoma this 17 day of December, 1999.

Signature of Inventor

Signed at _____ this _____ day of _____, 1999.

Signature of Inventor

Signed at Duncan, OK this 17th day of December, 1999.

Signature of Inventor

Explained to and Understood by Me _____ 12/17/99

Signature of Witness Date